Claims

1. A method for purifying a gas stream containing at least hydrogen (H_2), carbon monoxide (CO), at least one metal carbonyl and at least one impurity selected from oxygen (O_2) and unsaturated hydrocarbons, in which:

(a) the gas stream is contacted with a first catalyst bed (12) comprising at least one catalyst containing copper, in order to convert at least part of the oxygen and/or at least one unsaturated hydrocarbon present in the gas stream to one or more catalysis products, at a temperature of between 100°C and 200°C and at a pressure of at least 10 bar, and

(e) said gas stream is contacted with a second adsorption bed (9) to adsorb at least one metal carbonyl.

2. The method as claimed in claim 1, characterized in that the temperature is between 120°C and 180°C and/or the pressure is between 10 and 18 bar, preferably about 20 to 50 bar.

3. The method as claimed in either of claims 1 and 2, characterized in that the gas hourly space velocity is between 1000 and 10 000 $Sm^3/h/m^3$, preferably between 1000 and 6000 $Sm^3/h/m^3$.

4. The method as claimed in one of claims 1 to 3, characterized in that the gas stream also contains one or more organosulfur, organonitrogen and/or organochlorine compounds, and in that:

(b) the gas stream is contacted with a second catalyst bed (10) to convert at least part of the organosulfur, organonitrogen and/or organochlorine compounds to organic compounds and to polar inorganic compounds, and

(c) the gas stream is contacted with a third adsorption bed (11) to adsorb at least part of the inorganic compounds produced in step (b).

5. The method as claimed in one of claims 1 to 4, characterized in that the gas stream also contains HCN impurities and/or at least one compound of an element selected from the group formed by mercury, sulfur, chlorine, arsenic, selenium, bromine and germanium, and in that:

(d) said gas stream is contacted with a first adsorption bed (3, 4) to adsorb at least part of the HCN impurities and/or at least one compound of at least one element selected from the group formed by mercury, sulfur, chlorine, arsenic, selenium, bromine and germanium.

6. The method as claimed in one of claims 1 to 5, characterized in that the gas stream also contains at least one nitrogen oxide (NOx), and in that:

(f) said gas stream is contacted with a third catalyst bed to convert at least one nitrogen oxide present in the gas stream.

7. The method as claimed in one of claims 1 to 6, characterized in that steps (a) and (f) are distinct.

8. The method as claimed in one of claims 1 to 6, characterized in that steps (a) and (f) are combined.

9. The method as claimed in one of claims 1 to 8, characterized in that in step (a), at least part of the oxygen and/or at least one unsaturated hydrocarbon are converted to catalysis products selected from water vapor (H_2O), carbon dioxide (CO_2) and/or alkanes.

10. The method as claimed in one of claims 1 to 9, characterized in that the gas stream to be separated

contains 10% by volume to 90% by volume of H_2, 10% by volume to 90% by volume of CO and, optionally, methane.

11. The method as claimed in one of claims 1 to 10, characterized in that the gas stream issuing from one or the other of steps (a) or (f) is contacted with a fourth adsorption bed to remove H_2O and/or CO_2 and/or optionally CH_3OH and/or hydrocarbons formed during the passages over the catalyst beds, and/or a scrubbing step to remove the CO_2 and/or the methanol therein, particularly an amine scrub.

12. The method as claimed in one of claims 1 to 11, characterized in that the gas stream is subjected to at least one compression step (5) upstream of step (a) and in which all or part of the heat generated by the compression of the stream is used to reach the desired temperature.